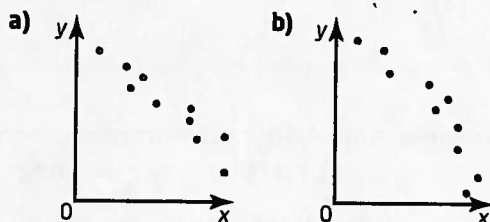


Chapter 4 Review

4.1 Investigate Non-Linear Relations, pages 164–167

1. Which scatter plot(s) could be modelled using a curve instead of a line of best fit? Explain.



2. A scientist tested the strength of wood beams by securing beams of various lengths and placing a 500-kg mass at the end of each beam. The table shows the mean deflections, in centimetres.

Length (m)	Deflection (cm)
1.0	0.33
1.5	1.48
2.0	2.51
2.5	4.22
3.0	6.11
3.5	8.17
4.0	10.52
4.5	12.98
5.0	16.72

- a) Make a scatter plot of the data. Draw a curve of best fit.
b) Describe the relationship between the length of the beam and the deflection.
c) Use your curve of best fit to predict the deflection of a 6.0-m-long beam.

4.2 Quadratic Relations, pages 168–173

3. Use finite differences to determine whether each relation is linear, quadratic, or neither.

a)	x	y	b)	x	y	c)	x	y
	1	11		-2	-10		-2	-9
	2	18		-1	-2		-1	-6
	3	27		0	0		0	-3
	4	38		1	2		1	0
	5	51		2	10		2	3

4. The flight of an aircraft from Toronto to Montréal can be modelled by the relation $h = -2.5t^2 + 200t$, where t is the time, in minutes, and h is the height, in metres.

- a) Graph the relation.
b) How long does it take to fly from Toronto to Montréal?
c) What is the maximum height of the aircraft? At what time does the aircraft reach this height?

4.3 Investigate Transformations of Quadratics, pages 174–179, and

4.4 Graph $y = a(x - h)^2 + k$, pages 180–188

5. Sketch the graph of each parabola. Describe the transformation from the graph of $y = x^2$.

- a) $y = x^2 - 6$
b) $y = -0.5x^2$
c) $y = (x - 2)^2$
d) $y = -2x^2$

6. Copy and complete the table for each parabola. Replace the heading for the second column with the equation for the parabola. Then, sketch each parabola.

Property	$y = a(x - h)^2 + k$
Vertex	
Axis of symmetry	
Stretch or compression factor relative to $y = x^2$	
Direction of opening	
Values x may take	
Values y may take	

- a) $y = (x - 1)^2 - 4$
b) $y = 2(x + 3)^2 + 1$
c) $y = \frac{1}{4}(x - 5)^2 + 1$
d) $y = -(x + 2)^2 + 6$

4.5 Quadratic Relations of the Form

$y = a(x - r)(x - s)$, pages 189–193

7. Sketch a graph of each quadratic. Label the x -intercepts and the vertex.

a) $y = -(x + 5)(x - 7)$

b) $y = 2(x - 3)(x + 1)$

8. The path of a football can be modelled by the equation $h = -0.0625d(d - 56)$, where h represents the height, in metres, of the football above the ground and d represents the horizontal distance, in metres, of the football from the player.

- Sketch a graph of this relation.
- At what horizontal distance does the football land?
- At what horizontal distance does the football reach its maximum height? What is its maximum height?

4.6 Negative and Zero Exponents,

pages 194–201

9. Evaluate.

a) 7^{-2}

b) 13^0

c) 10^{-5}

d) $(-34)^0$

e) $(-6)^{-1}$

f) $(-7)^{-2}$

g) 6^0

h) $\left(-\frac{2}{5}\right)^{-3}$

10. Joan won a multi-million dollar lottery. She decides to give \$1 000 000 of her winnings to charity. Her plan is to give $\frac{1}{2}$, or 2^{-1} , to charity in January, and then give half of the remaining amount in February, half again in March, and so on.

- What fraction remains after 6 months?
- What fraction remains after 12 months?
- Write each fraction as a power of 2 with a negative exponent.
- What amount is remaining at the end of the year?

Chapter Problem Wrap-Up

In Section 4.1, question 6, Section 4.2, question 7, and Section 4.4, question 16, you used data from a landfill site to make a scatter plot, draw a curve of best fit, test for a quadratic relation, and determine an equation.

- Identify the values of x for which your model is accurate.
- Use your model to predict the total mass of garbage in the landfill in 2020. Comment on the accuracy of your prediction.
- Analyse how the equation and the graph would change if this city instituted a mandatory recycling program.
- A statistical analyst suggested that you could use an exponential model of the form $y = 200 \times b^x$, where x represents the number of years after 2000. What evidence could justify using this model? Determine an appropriate value of b .